10586091
TS 9/4/09

material as the bellows portion 102, a large frictional resistance occurs between the steering shaft and the shaft sealing portion 101, and that offensive sound is emitted during rotation of the steering shaft by the operation of the steering wheel since the steering shaft and the shaft sealing portion 101 rub against each other. – –

0021
– – **[~~0061~~]** The structure of the present invention will now be explained in detail based on a best mode illustrated in the drawings where the same reference numerals are used to designate the same or functionally similar parts throughout the drawings. – –

TS 9/4/09

0023
– – **[~~0063~~]** The main body 30 of dust seal has a plurality of bellows in an ~~which stands up from the panel 19.~~

~~[0064] The main body 30 of dust seal has a plurality of bellows in an~~ axial direction of the steering shaft 20, for example, a first bellows 3a close to the vehicle compartment 17 side, and a second bellows 3b close to the engine room 18 side. In this case, for rubber material constituting the main body 30 of dust seal, material having high flexibility to favorably follow up an oblique movement of the steering shaft 20 is preferably used, and, for example, ethylene-propylene rubber is used in the present embodiment. Also, for the seal lip 4, in the present embodiment, for example, there is used NBR (acrylonitrile-butadiene rubber) having excellent physical properties for sealing sliding portions. However, the above-described material is a suitable exemplification, and other materials may be used. In this respect, in the present embodiment, the description is mainly made of a case where two bellows: first and second 3a and 3b are provided, and

10586091
TS 9/4/09

if necessary, there may be provided three or more bellows. – –

– – **[0067]** Here, when the steering shaft 20 inclines with respect to a direction indicated by an arrow A of FIG. 3, the first bellows 3a, which is farther from a center of rotation of the oblique movement, has a larger amount of deformation than the second bellows 3b, which is close to the center of rotation thereof. Thus, in the present embodiment, the curvature of the apex portion 10a of the first bellows 3a located closest to the vehicle compartment 17 side is made larger than the curvature of the apex portion 10b of the second bellows 3b. In other words, a curvature radius of the apex portion 10a is made smaller than that of the apex portion 10 b. With the features as described above, length of the inclined portion 9a in the first bellows 3a can be made longer than the inclined portion [[9a]] 9b of the second bellows 3b without changing an angle of the inclined ~~portion 9a~~ portions 9a, 9b of both bellows 3a, 3b, and since the apex portion 10a of the first bellows 3a becomes easier to flex, the first bellows 3a can be made easier to become deformed larger in a radial direction of the steering shaft 20 than the second bellows 3b. Thereby, the follow-up properties of the main body 30 of dust seal to inclination or deviation or the like of the steering shaft 20 can be improved. – –

0037
TS 9/4/09

– – **[~~0078~~]** The dust cover 1 for a steering shaft according to the present embodiment is assembled, for example, by the following method using: the bush 2 made integral with the seal lip 4; the main body 30 of dust seal comprising the first and second bellows 3a and 3b integrated with each other; and the fixing member 5. First, the fixed

10586091
TS 9/4/09

IN THE SPECIFICATION:

In the published version of this application which is US 2008/0231003, please correct the following paragraphs to read::

– –**[0003]** As a conventional dust cover for a steering shaft, there is one disclosed in Japanese Patent Publication No. 2001-324018. Referring to Fig. 17, the [[The]] dust cover 100 for a steering shaft that has a shaft sealing portion 101 that passes the steering shaft therethrough and is in contact with the steering shaft, and two bellows portions 102 and 102 having an inner peripheral end coupled to the shaft sealing portion 101 and an outer peripheral end attached to a panel fixing member 103. The shaft sealing portion 101 and the two bellows portions 102 and 102 are formed of rubber material and are integrally formed by using metal mold. In this technique, sound insulating properties are enhanced by providing these two bellows portions 102 and 102. Also the two bellows portions 102 and 102 and the shaft sealing portion 101 passing the steering shaft therethrough, are integrally formed, so that an operation of incorporating to a vehicle body is facilitated. – –

TS 9/4/09

0032

– –**[0073]** On the outer peripheral surface of the bush 2, there are formed a fitted-in portion 22 in which each fixed portion 32a, 32b of the first, second bellows 3 is fitted, and a stepped portion 14 for preventing the main body 30 of dust seal from coming off. In the case of the present embodiment, the stepped portion 14 is formed by a flange formed on one end portion of the bush 2, for example, the end portion on the engine room 18 side. Also, on an end portion at a side opposite to the end portion on which the flange 14 of the bush 2 is formed, that is, on an end portion on the vehicle compartment 17 side, there is

10586091
TS 9/4/09

0041

– – **[0082]** Also, for example, in the above-described embodiment, after the fixing member 5 is pressed into the bush 2, in which the first, second bellows ~~3a, 3b~~ 3a', 3b' is fitted, the bush 2 is plastically deformed by heating to thereby fix the fixing member 5 to the bush 2. The present invention, however, is not always limited to this example, but it may be possible, for example, to fit the fixing member 5 heated into the bush 2 in which the first, second bellows ~~3a, 3b~~ 3a', 3b' is fitted, and to fix the first, second bellows ~~3a, 3b~~ 3a', 3b' to the bush 2 in a state where the fixing member 5 is cooled and heat-shrinks, and the fixing member 5 then tightens the first, second bellows ~~3a, 3b~~ 3a', 3b' to the bush 2. Or it may be possible to fit the fixing member 5 into the bush 2, in which the first, second bellows ~~3a, 3b~~ 3a', 3b' is fitted, and by plastically deforming the fixing member 5 in this state, to fix the fixing member 5 to the bush 2 in a state where the first, second bellows ~~3a, 3b~~ 3a', 3b' is pressed against the bush 2. Also, the main body [[30]] 30' of dust seal may be formed integrally with the seal lip 4 if necessary. – –

TS 9/4/09

0043

– – **[0084]** In the dust cover for a steering shaft according to the present embodiment, as shown in FIG. 9, even at the end portion of the bush [[2]] 2' on the vehicle compartment 17 side, there is arranged an annular seal lip 25 which is in contact with the outer peripheral surface of the steering shaft 20, and grease filled in the groove 12 in the bush [[2]] 2' is sealed from both sides in corporation with the seal lip 4 arranged at the end portion on the engine room 18 side. Thereby, it becomes possible to prevent grease to be filled between the steering shaft 20 and the bush [[2]] 2' from flowing out, and to sufficiently prevent stick-slip caused by grease shortages from occurring. In other words, even only the seal lip 4 arranged on the engine room 18 side of the bush [[2]] 2' is capable of preventing the grease that is held on the inner peripheral surface of the bush [[2]] 2' from

10586091
TS 9/4/09

coming off to cause insufficient lubrication, and in addition to this, a lip 25 is provided on the vehicle compartment 17 side, whereby it can be reliably realized to hold the grease between both lips 4 and 25 for sealing within the bush [[2]] 2'. For this seal lip 25, for example, rubber material or elastomer excellent in sliding properties and sealing properties is preferably used as in the case of the seal lip 4, and although it is not limited to a specific material, it is suitable to use NBR (acrylonitrile-butadiene rubber). The seal lip 25 is mounted to any of the bush [[2]] 2', or the fixing member [[5]] 5' or the main body of dust seal, and is arranged in the vicinity of the end portion of the bush [[2]] 2' on the engine room 18 side. The seal lip 25 according to the present embodiment is integrally formed together with the fixing member [[5]] 5', and is provided such that it can be arranged on the engine room 18 side of the bush [[2]] 2' at the moment when the fixing member [[5]] 5' is mounted to the bush [[2]] 2'. – –

0044
TS 9/4/09

– – **[0085]** Also, the fixing member [[5]] 5' according to the present embodiment is formed by synthetic resin, for example, polyamide resin. As shown in FIGS. 9 and 15, the fixing member [[5]] 5' is shaped like a stepped ring having a large-diameter tube portion [[5a]] 5a' for holding an inside diameter side end portion of the bellows portion 3a, 3b, and a small-diameter tube portion [[5b]] 5b' for directly fitting in the bush [[2]] 2', and has a taper-shape having a tip edge being a curved surface such that a tip opening edge [[5c]] 5c' of the large-diameter tube portion [[5a]] 5a' does not become sharpness to abut against the bellows 3. When the fixing member [[5]] 5' of such a shape is mounted to the bush [[2]] 2', in the large-diameter tube portion [[5a]] 5a', each fixed portion 32a, 32b of the first and second bellows 3a and 3b is tightened in a partially overlapped state between the large-diameter tube portion [[5a]] 5a' and the bush [[2]] 2' for holding (See FIG. 9).

10586091
TS 9/4/09

Thereby, since the inner peripheral end 32a, 32b of each bellows 3a, 3b is further tightened by the fixing member [[5]] 5' with the bush [[2]] 2' in a state where it is fitted in the bush [[2]] 2', the bellows 3a, 3b can be reliably fastened to the bush [[2]] 2'. Moreover, since the tightening force by the fixing member [[5]] 5' is received by the bush [[2]] 2', the smooth rotation of the steering shaft 20 is not prevented. In this case, on the fixing member [[5]] 5' according to the present embodiment, there is integrally provided the lip 25. Specifically, as shown in FIGS. 15 and 16, the fixing member [[5]] 5' made of polyamide resin obtained by injection molding in advance is contained within a mold of the lip 25 in a state where a surface in which the lip 25 fits, for example, the outer peripheral surface of the small-diameter tube portion [[5b]] 5b' is coated with adhesive, and the lip 25 is vulcanized and molded with the fixing member [[5]] 5' as core material, whereby it is to be formed integrally with the fixing member [[5]] 5'. – –

0045

TS 9/4/09

– – **[~~0086~~]** Also, in the dust cover for a steering shaft according to the present embodiment, as shown in FIGS. 9, 12 and 14, as structure in which the fixing member [[5]] 5' is mounted to the bush [[2]] 2', there is adopted a snap lock type which fixes when the fixing member [[5]] 5' is pressed into a predetermined position. In other words, the end portion of the bush [[2]] 2' on the vehicle compartment 17 side is provided with a hook 26 which is elastically deformed in a radial direction, whereby when a ring-shaped fixing member [[5]] 5' is fitted in, the tip of the hook 26 bends inwardly in the radial direction, after the fixing member [[5]] 5' passes, the hook tip returns to the original position, the tip of the hook 26 is caught in the rear end of the fixing member [[5]] 5' which functions to prevent the fixing member [[5]] 5' fitted in the bush [[2]] 2' from coming off. At the tip of the hook 26 there is provided a pawl portion 27 having an inclined surface 27a which comes into

10586091
TS 9/4/09

0046

--[~~0087~~] Further, a surface (See [[FIG.]] FIGS. 3 and 11) with which an fixing area 31 of the main body 30 of dust seal made of rubber fits in the inner peripheral surface of the hole cover 23 that is the outer peripheral surface 31c of the tubular portion 31a, preferably comprise a rough surface, shown by the pattern of several small dots in Figure 9, that reduces a contact area and hence the coefficient of friction, thereby improving fixing properties. In other words, in order to maintain the sealing properties or a fixing force, there may be cases where the outside diameter (outside diameter of the fixing area 31) of the dust cover 1 for a steering shaft is made larger than the inside diameter of the column hole 24 of the panel 19 to thereby conduct tight fit. In such a case, since the surface of the fixing area 31 of the main body 30 of dust seal made of rubber is difficult to slip, and it becomes difficult to install the dust cover 1 for a steering shaft to the panel 19, the workability is supposed to be deteriorated accordingly. If, however, the fitted-in portion (outer peripheral surface 31c of the tubular portion 31a) of the dust cover 1 for a steering shaft to the hole cover 23 is provided with fine concave and convex portions to have a rough surface for reducing the coefficient of friction (in other words, reduce the contact area) in advance, it will become easier that much to install. Moreover, since the interference itself is not changed even if it is made easier to install as. described above, the sealing properties and the fixing force will not be affected. Such fine concave and convex portions can be provided by etching treatment (chemical treatment) for etching the surface of seal forming mold by the action of chemicals, honing treatment (physical treatment) that blows off sand, glass beads and the like onto the surface of an object physically, embossing and the like. Such fine concave and convex portions or shallow concave and convex surfaces are well known as satin finish, graining or the like. Note that these concave and convex portions on the surface may be such that the coefficient of friction is reduced in such a degree as to

TS 9/4/09

10586091
TS 9/4/09

IN THE SPECIFICATION:

In the published version of this application which is US 2008/0231003, please correct the following paragraph **[~~0081~~]** (which corresponds to paragraph [0040] on page 23 of the specification as originally filed) to read:

TS 9/4/09

0040

--**[~~0081~~]** In this respect, although the above-described embodiment is an example of preferred embodiments according to the present invention, the present invention is not limited thereto, but can be carried out by modifying in various ways without departing from the gist of the invention. Depending on, for example, a requirement for space savings within the vehicle compartment 17 or for the design or the like, there may be provided a dust cover 1 for a steering shaft in which the bush 2 is in advance obliquely arranged with respect to an installation panel 19 as shown in FIGS. 6 to 8. In FIGS. 6 to 8, component elements identical to those in the above-described embodiment are designated by the identical reference numerals. In examples shown in FIGS. 6 to 8, the first bellows [[3a]] 3a' and the second bellows [[3b]] 3b' are formed as a separate member respectively, and are to be integrally combined by fitting in the end portions of the first bellows [[3a]] 3a' and the second bellows [[3b]] 3b' on their mutual outer periphery side. For example, the outer peripheral end of the first, second bellows ~~3a, 3b~~ 3a', 3b' is oblong, and they are fitted in each other with the reinforcement member [[6]] 6' interposed therebetween. The outer peripheral end of the second bellows [[3b]] 3b' has an oblong tubular portion [[31a]] 31a' which abuts against the inner peripheral surface of the column hole formed on the panel 19, and the outer peripheral end of the first bellows [[3a]] 3a' has an oblong flange portion [[31b]] 31b' which abuts against the peripheral edge of the column hole formed on the